

CLAIMS

1. A method for processing a computer aided polygon model, comprising:

forming (502) a vertex array which is linear and static and comprises the vertices of the image elements of the polygon model;

forming (504) an index array which is linear and the elements of which determine the image elements of the polygon model by pointing at the vertices of the image elements in the vertex array, and which index array comprises an active part, the image elements determined by the elements of the active part being included in the polygon model part to be presented graphically; **characterized by**

forming (506) additionally a hierarchical data structure whose hierarchy is based on the division of the vertices in the image space, the nodes of which hierarchical data structure point at nodes of a lower level in the hierarchy, the leaf nodes of the hierarchical data structure pointing at elements of the active part of the index array; and

reducing (510) the polygon model part to be presented graphically by means of the hierarchical data structure, maintaining the linearity of the index array.

2. A method according to claim 1, **characterized by** reducing (510) the polygon model by

removing (602) at least two hierarchically equal leaf nodes from the hierarchical data structure;

including (604) the location information representing the vertices pointed at by the index array elements pointed at by said at least two leaf nodes in a node of an upper level in the hierarchy, whereby this upper level node becomes a leaf node; and

removing (606) at least one element of the index array pointed at by said at least two hierarchically equal leaf nodes from the active part.

3. A method according to claim 1, **characterized by** forming (504) an index array in such a way that the index array also comprises a passive part, the vertices pointed at by the elements of the passive part belonging outside the polygon model part to be presented graphically; and

reducing (510) the polygon model part by moving at least one index array element from the active part to the passive part.

4. A method according to claim 1, **characterized** by forming (506) a hierarchical data structure by:

dividing (702) the coordinate space represented by the polygon model into hierarchical sectors on the basis of vertices contained in the vertex array;

including (704) the pointers of the nodes corresponding to the sectors of the next lowest level in the hierarchy in the node corresponding to each hierarchical sector;

including (706) the pointers pointing at the index array elements pointing at the vertices determining the lowest hierarchical sector in the leaf nodes.

5. A device for processing a computer aided polygon model, **characterized** in that the device comprises:

a vertex array (402) which is linear and static and comprises the vertices of the image elements of the polygon model;

an index array (404) which is linear and the elements of which determine the image elements of the polygon model by pointing at the vertices of the image elements, and which index array (404) comprises an active part (412), the image elements determined by the elements of the active part being included in the polygon model part to be presented graphically; and

a hierarchical data structure (406) whose hierarchy is based on the division of the vertices in the image space, the nodes of which hierarchical data structure (406) point at nodes of a lower level in the hierarchy, the leaf nodes of the hierarchical data structure (406) pointing at elements of the active part (412) of the index array (404); and

a processing unit (408) connected to the index array (404), the hierarchical data structure (406) and the vertex array (402) to reduce the polygon model part to be presented graphically by means of the hierarchical data structure (406), maintaining the linearity of the index array (404).

6. A device according to claim 5, **characterized** in that the processing unit (408) is arranged to remove at least two hierarchically equal leaf nodes from the hierarchical data structure (406);

the processing unit (408) is arranged to include the location information representing the vertices pointed at by the index array elements pointed at by at least two leaf nodes in a node of an upper level in the hierarchy, whereby this upper level node becomes a leaf node; and

the processing unit (408) is arranged to remove at least one index array element pointed at by said at least two hierarchically equal leaf nodes from the active part.

7. A device according to claim 5, **characterized** in that the index array (404) further comprises a passive part (414), the vertices pointed at by the elements of the passive part belonging outside the polygon model part to be presented graphically; and

the processing unit (408) is arranged to reduce the polygon model by moving at least one index array element from the active part (412) to the passive part (414).

8. A device according to claim 5, **characterized** in that the hierarchical data structure (406) includes hierarchical sectors based on vertices of the vertex array;

the node corresponding to each hierarchical sector includes the pointers of the nodes corresponding to the sectors of the next lowest level in the hierarchy; and

the leaf nodes of the hierarchical data structure (406) include pointers pointing at the index array elements pointing at the vertices determining the lowest hierarchical sector.

9. A computer program for processing a polygon model, which computer program is embodied in a distribution medium readable by a computer, **characterized** in that the computer program comprises:

a vertex array (402) which is linear and static and which includes the vertices of the image elements of the polygon model;

an index array (404) which is linear and the elements of which determine the image elements of the polygon model by pointing at the vertices of the image elements, and which index array (404) comprises an active part (412), the image elements determined by the elements of the active part being included in the polygon model part to be presented graphically;

a hierarchical data structure (406) whose hierarchy is based on the division of the vertices in the image space, the nodes of which hierarchical data structure point at nodes of a lower level in the hierarchy, the leaf nodes of the hierarchical data structure pointing at elements of the active part (412) of the index array; and

computer-executable commands to reduce (508) the polygon model part to be presented graphically by means of the hierarchical data structure, maintaining the linearity of the index array.

10. A computer program according to claim 9, **characterized** in that the computer program comprises:

- a computer-executable command (602) to remove at least two hierarchically equal leaf nodes from the hierarchical data structure;

- a computer-executable command to include (604) the location information representing the vertices pointed at by the index array elements pointed at by said at least two leaf nodes in the node of an upper level in the hierarchy, whereby this upper level node becomes a leaf node; and

- a computer-executable command to remove (606) at least one element of the index array pointed at by said at least two hierarchically equal leaf nodes from the active part (412).

11. A computer program according to claim 9, **characterized** in that the index array (404) further comprises a passive part (414), the vertices pointed at by the elements of the passive part belonging outside the polygon model part to be presented graphically; and

the computer program includes a computer-executable command to reduce (508) the polygon model by moving at least one index array element from the active part (412) to the passive part (414).

12. A computer program according to claim 9, **characterized** in that the hierarchical data structure (406) includes hierarchical sectors based on vertices of the vertex array;

- the node corresponding to each hierarchical sector includes the pointers of the nodes corresponding to the sectors of the next lowest level in the hierarchy; and

- the leaf nodes of the hierarchical data structure (406) include pointers pointing at the index array elements pointing at the vertices determining the lowest hierarchical sector.